DOOR MODULE SYSTEM FOR VEHICLES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present invention claims the benefit of priority to U.S. Provisional Patent Application No. 60/520,986 titled DOOR MODULE SYSTEM filed on November 18, 2003, the full disclosure of which is hereby incorporated herein by reference.

FIELD

[0002] The present invention relates to a door module system. More specifically, the present invention relates to a non-structural trim door module that includes a variety of components and may be coupled to a vehicle structure such as a vehicle door. The non-structural door module includes such features as window regulators, speakers, a single wire harness, switches, lights, water and/or acoustical barriers, handles, latches (which preferably are attached to the panel but which may be connected as separate mini-modules), and the like.

BACKGROUND

[0003] It is generally known to provide door module systems for a vehicle. Such door module systems typically include a structural carrier or cassette. However, such door module systems have several disadvantages including high tooling and manufacturing costs, high labor costs, incompatible component design, and the like.

[0004] Accordingly, it would be advantageous to provide a door module system having lower tooling and manufacturing costs. It would also be advantageous to provide a door module system having lower labor costs. It would further be advantageous to provide a door module system having a non-structural carrier that integrates one or more door related components. It would be desirable to provide for a door module system having one or more of these or other advantageous features. To provide an inexpensive, reliable, and

widely adaptable door module system that avoids the above-referenced and other problems would represent a significant advance in the art.

SUMMARY

[0005] The present invention relates to a door module for a vehicle door comprising a non-structural substrate carrier, a door trim panel configured to be coupled to the substrate carrier, a door trim interface member integrally molded with the carrier as a single unitary article, and a carrier interface member extending from the door trim panel. The door trim panel is releasably coupled to the carrier by releasable engagement of the door trim interface member and the substrate carrier interface member.

[0006] The present invention also relates to a method of preparing a module vehicle door for transportation to a location for assembly of a vehicle door. The method comprises providing a non-structural carrier and a door trim panel, and mounting the trim panel to the carrier by engaging a projection on the trim panel with a retainer integrally molded with the carrier.

[0007] The present invention further relates to a method of assembling a vehicle door having a non-structural carrier, a trim panel, and a structural frame. The method comprises receiving the carrier and the trim panel at the location for assembly of the vehicle door, removing the trim panel from the non-structural carrier, coupling the carrier to the structural frame, and mounting the trim panel to the non-structural carrier

[0008] The present invention further relates to a door module for a vehicle door comprising a non-structural substrate carrier having a first interface member and an integrally molded impact absorber, and a door trim panel configured to be coupled to the substrate carrier and having a second interface member. The door trim panel is releasably coupled to the carrier by releasable engagement of the first interface member and the second interface member.

[0009] The present invention further relates to various features and combinations of features shown and described in the disclosed embodiments. Other ways in which the objects and features of the disclosed embodiments are accomplished will be described in the following specification or will become apparent to those skilled in the art after they have read this specification. Such other ways are deemed to fall within the scope of the disclosed embodiments if they fall within the scope of the disclosed embodiments.

DESCRIPTION OF THE FIGURES

[0010] FIGURE 1 is a perspective view of a modular door assembly with a door module and door trim panel according to a preferred embodiment.

[0011] FIGURE 2 is a perspective view of a door module being assembled to a door frame according to a preferred embodiment.

[0012] FIGURE 3 is an exploded view of a door module and door trim panel illustrating the door features integrated into the carrier.

[0013] FIGURE 4 is a fragmentary perspective view of the door trim panel engaging the door module.

[0014] FIGURE 5 is a section view of the door trim panel engaged with the door module taken along line 5-5 in FIGURE 4.

[0015] Before explaining a number of preferred, exemplary, and alternative embodiments of the invention in detail it is to be understood that the invention is not limited to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or being practiced or carried out in various ways. It is also to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

DETAILED DESCRIPTION

[0016] Before beginning the detailed description of the preferred, exemplary and alternative embodiments of the present invention, several general comments can be made about the applicability and scope of this invention. The term "non-structural" as used herein means that the door module carrier or substrate is not capable of transferring loads (e.g., from the window regulator system) throughout the carrier. According to one exemplary embodiment, the door module carrier may be configured to become structural when it is attached to a structural component of the vehicle, of carrying any primary crash loads, slam loads, consumer usage loads or window actuation loads, even though the door module carrier itself is not capable of carrying handling, shipping and non-operational loads created by the weight of regulators, handles, map pockets, wire harnesses, arm rests, and the like.

[0017] Operational loads for such door module carrier components can be up to several hundred pounds for door systems that include such loads as the pull load on a door strap, a user leaning on an armrest, pulling on the door latch, vertical window "break in" loads, and the like. In contrast, the door module carrier of the present invention is non-structural and serves as a medium for integrating various mechanical and electrical components associated with fabrication and assembly. In the present invention all operational loads of the mechanical or electrical components are transferred directly to a structural vehicle part at the time the door module carrier is fastened thereto.

[0018] The door module carrier is shown to include a number of operating, safety and convenience components. However, the invention is much broader than the illustrated embodiment, and once appreciated by those skilled in the art, the non-structural aspect of the door module carrier of the present invention can be adapted to a wide variety of vehicles and include other components used with the particular module, i.e., those which are used with prior art structural modules.

[0019] Components such as speakers, electronic window actuators, door lights, and a variety of other operating, convenience and design components are illustrated in the FIGURES, but these should not lead anyone reviewing this disclosure to believe that the invention is limited to these types of door trim modules. Other components which may be located on the door module carrier include door latch actuators, electronic modules, air bag modules, storage bins, HVAC components, and the like. The non-structural door module carrier can also be applied to a wide variety of vehicle door or trim modules, including those used for liftgates, tailgates, cargo trim, side trim and other vehicle trim areas where a trim or a door module are secured to the vehicle structure.

[0020] Furthermore, while the present invention is described in connection with two particular types of water barriers, the non-structural door module carrier may be used in systems which do not include any type of water barrier or with other types of water barriers than those specifically illustrated. One skilled in the art will readily appreciate the additional steps which may be necessary to prevent damage to electrical components, depending upon the type and location, and the presence or absence of water barrier elements.

[0021] FIGURES 1-3 show a modular door 10 according to a preferred embodiment. Door module 10 is configured to be mounted within a vehicle door 12 and includes a substrate (e.g., carrier or cassette, shown as a carrier 14), a door trim panel 15, and any of a variety of door related components coupled to the carrier 14 (e.g., pull cup, wire harness 18, window regulator system 20, a speaker 22, and the like). Trim panel 15 includes an outer or "A"-surface that faces or is exposed to the occupant compartment (and visible to vehicle occupants), and an inner or "B"-surface that faces or is exposed to the interior of the door 12.

[0022] FIGURE 1 is a perspective view of the modular door assembly with a door module 10 and door trim 15 according to a preferred embodiment. FIGURE 3 is a perspective view of the door module 10 illustrating the door features or components

integrated into the carrier 14. According to an exemplary embodiment, door module 10 integrates one or more door components or features into the non-structural carrier 14 by integrally molding with the carrier as a single unitary article (e.g., molding the carrier and the door components in the same tool or mold).

[0023] According to a preferred embodiment shown in FIGURE 3, non-structural carrier 14 includes integrally molded impact countermeasures. The integrally molded countermeasures are shown as upper impact absorber 24 and lower impact absorber 26. Upper impact absorber 24 is shown as a series of cone-shaped projections extending from the carrier, and are configured to absorb energy from an impact. Lower impact absorber 26 is shown as a plurality of walls (e.g., projections, ribs, etc.), and are configured to absorb energy from an impact (e.g., a side impact to the door). Integration of upper impact absorber 24 and lower impact absorber 26 to carrier 14 is intended to simplify assembly and reduce floor space necessary when assembling the door. According to alternative embodiments, the upper impact absorber and the lower impact absorber may have any of a variety of shapes and configurations (e.g., egg-shell, grid, cylindrical, honeycomb, etc.).

[0024] According to a preferred embodiment shown in FIGURE 3, non-structural carrier 14 includes an integrally molded pull cup support 28 so that a pull cup bracket 30 can be coupled (preferably directly) to the carrier 14 (e.g., rather than to door steel or other structure). Pull cup support 28 is shown as generally box-shaped but may have any of a variety of shapes and configurations to accommodate brackets, carrier configuration, molding operations, and the like. A pull cup (not shown) is coupled to module 10 through the pull cup bracket 30 and the pull cup support 28.

[0025] According to a preferred embodiment shown in FIGURES 3-5, door module 10 includes a door trim interface and a substrate carrier interface (collectively comprising a first interface member and a second interface member, which are shown as a receptacle or retainer 32 and a projection 33) for mounting of the trim panel 15 to the non-

structural carrier 14. Referring to FIGURES 4 and 5, retainer 32 on carrier 14 is configured to receive a projection 33 (e.g., hook, prong, etc.) extending from inner surface of trim panel 15. Trim panel 15 is coupled (e.g., engages, hangs, etc.) to carrier 14 during transportation or shipping of trim panel 15 and carrier 14 (e.g., to the location of the door assembly) and again during assembly of module 10 to door 12 (e.g., the door steel). Trim panel 15 is uncoupled (e.g., unattached, disengaged, removed, separated, etc.) from carrier 14 during assembly of the door (e.g., when carrier is coupled to the door steel). Preferably, retainer 32 is integrally molded with carrier 14 and projection is integrally molded with trim panel 15. Alternatively, the projection is integrally molded with the carrier and the retainer is integrally molded with the trim panel. Retainer 32 may have any of a variety of shapes and configurations, including "U"-shaped (as shown in FIGURES 3 and 4), cup-shaped, or the like. To couple trim panel 15 to carrier 14, projection 33 is inserted into a space defined by retainer 32. Trim panel 15 is held in place by a friction fit between projection 33 and retainer 32. Alternatively, the interface between the projection and the retainer may be a snap-fit engagement.

[0026] Referring to FIGURE 2, vehicle door 12 also includes an outer structural member 42 (e.g., outer door steel), an inner structural member 44 (e.g., inner door steel), window glass 46, and guide rails 48, 50. In an exemplary embodiment of the assembled vehicle door 12, the sequence of components includes outer structural member 42, glass 46, guide rails 48, 50, inner structural member 44, non-structural carrier 14, and trim panel 15.

[0027] Referring to FIGURES 3-5, vehicle door 12 is assembled as follows. The non-structural carrier 14 is transferred (e.g., shipped from the supplier) with the rails 48, 50 attached in a shipping or installation position. Trim panel 15 is coupled to carrier 14 by engagement of projections 33 and receptacles 32. The carrier 14 is loaded into the door frame (which is comprised of the assembled inner structural member 44 and outer structural member 42). The trim panel 15 is detached from the door module 10 and hung on an

assembly line rack or fixture 54. Wiring may be fished through the carrier 14 if necessary. Fasteners used to mount the rails to the inner structural member (e.g., bolts) are located relative to the inner structural member 44 to interface with the inner structural member 44. The fasteners are tightened. The carrier 14 is pressed or pushed into engagement with the inner structural member 44 of the door "steel" (e.g., using press fit fasteners). Module attachments may be made to the steel and latch. For example, the regulator and the latch are coupled to the door steel and the module is coupled (e.g., with a snap engagement) to the door steel with clips (e.g., metal, plastic, etc.). The glass 46 is installed between the inner structural member 44 and the outer structural member 42, and is disposed between the rails 48, 50 and the carrier 14 when in the lowered position. The door trim 15 is reattached to module 10 and door steel 44.

[0028] Referring to FIGURES 1 and 2, the door module 10 and door trim 15 are attached together for shipping. FIGURE 2 is a perspective view of the door module being assembled to a door frame according to a preferred embodiment. Prior to or during installation, the trim 15 is removed from the door module 10 after initial or preparation for installation and is hung on an assembly line fixture 54 as the module is coupled to the door steel and door components are coupled to the module and/or the door steel.

[0029] The particular materials used to construct the exemplary embodiments are also illustrative. For example, injection molded polypropylene is the preferred method and material for making the top and base, but other materials can be used, including other thermoplastic resins such as high density polyethylene, other polyethylenes, acrylonitrile butadiene styrene ("ABS"), polyurethane nylon, any of a variety of homopolymer plastics, copolymer plastics, plastics with special additives, filled plastics, etc. Also, other molding operations may be used to form these components, such as blow molding, rotational molding, etc.

[0030] It is also important to note that the construction and arrangement of the elements of the modular door system as shown in the preferred and other exemplary embodiments are illustrative only. Although only a few embodiments of the present invention have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited in the claims. For example, elements shown as integrally formed may be constructed of multiple parts or elements show as multiple parts may be integrally formed, the operation of the interfaces may be reversed or otherwise varied, the length or width of the structures and/or other elements of the system may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures and combinations. Accordingly, all such modifications are intended to be included within the scope of the present invention as defined in the appended claims. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. In the claims, any functional description is intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Other substitutions, modifications, changes and/or omissions may be made in the design, operating conditions and arrangement of the preferred and other exemplary embodiments without departing from the spirit of the present invention as described herein.